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51. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pennsylvania.

A banker, in discounting a note due in $m=4$ months at $r=3\%$ per annum charges $C=C12\frac{1}{4}$ more than the true discount. What is the face of the note discounted?

I. Solution by G. B. M. ZEER, A. M., Ph. D., Vice President and Professor of Mathematics in the Texarkana College, Arkansas.

$$m \text{ months } +3 \text{ days grace } =\frac{10m+1}{10} \text{ months.}$$

$$\frac{(10m+1)r}{12000}=\text{bank discount on \$1 at } r\% \text{ for } \frac{10m+1}{10} \text{ months.}$$

$$\frac{1200+mr}{1200}=\text{amount of \$1 at } r\% \text{ for } m \text{ months.}$$

$$\frac{1200}{1200+mr}=\text{proceeds of \$1 at } r\% \text{ for } m \text{ months.}$$

$$1-\frac{1200}{1200+mr}=\frac{mr}{1200+mr}=\text{true discount.}$$

$$\frac{(10m+1)r}{12000}-\frac{mr}{1200+mr}=\frac{(1200+10m^2r+mr)r}{12000(1200+mr)}=\text{difference.}$$

$$\therefore\ \frac{12000(1200+mr)C}{(1200+10m^2r+mr)r}=\text{face of note.}$$

Substituting $m=4$, $r=3$, $C=12\frac{1}{4}$, we get face of note=\$35099.29.

II. Solution by the PROPOSER.

Represent the face of the note by X, and the number of days of grace by g; then the *bank discount* is $(30m+g)rX/36000$, and the *true discount* is $mrX/(1200+mr)$. According to the problem,

$$\left[\frac{30m+g}{36000}-\frac{m}{1200+mr}\right]rX=C\ldots.(1),$$

$$\therefore\ X=\frac{36000(1200+mr)}{[(30m+g)mr+1200g]r} \text{ of } \$C,=\$35099.2908, \text{ which is the face}$$

of the note required.

NOTE—Make $g=0$; then $X=123725.00$, which is the result of Miscellaneous Problem, No. 844, *Lock and Scott's Arithmetic for Schools*, page 281.

III. Solution by COOPER D. SCHMITT, Professor of Mathematics in University of Tennesee, Knoxville, Tennesee.

Interest for 4 mon. 3 da. at 3% on any principal is $\frac{123}{12000}$ of the principal and bank discount is same as simple interest.

In true discount, the three days of grace are not counted.

The true discount on any principal for $\frac{1}{3}$ of a year at 3 per cent. is the same as for one year at 1%, which is $\frac{1}{101}$ of the principal.

Hence, $(\frac{123}{12000}-\frac{1}{101})$ of the principal=\$$12\frac{1}{4}$, or $\frac{423}{1212000}$ of principal=\$$12\frac{1}{4}$, and the principal=$\frac{1212000}{423}$ of $12\frac{1}{4}$=\$35099.29.

This problem was solved with different results by *P. S. BERG*, *J. F. W. SCHEFFER*, *A. L. FOOTE* and——.